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ST/F

E76-10274

TMX-73043 II

LANDSAT PROGRESS REPORT

FOR THE PERIOD 12 NOVEMBER TO 11 FEBRUARY, 1976

PLANNING APPLICATIONS IN EAST CENTRAL FLORIDA

CONTRACT NO. NAS5-20907

BREVARD COUNTY PLANNING DEPARTMENT

REPORT NO. BCPD L2-4

TMX

N76-21641

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CENTRAL FLORIDA Progress Report, 12 Nov.  
1975 - 11 Feb. 1976 (NASA) 29 p HC \$4.00  
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LANDSAT PROGRESS REPORT  
FOR THE PERIOD 12 NOVEMBER TO 11 FEBRUARY, 1976  
PLANNING APPLICATIONS IN EAST CENTRAL FLORIDA  
CONTRACT NO. NAS5-20907

Principal Investigator: John W. Hannah\*

Co-Investigators: Dr. Garland L. Thomas\*  
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Computer Programming: James J. Millard\*\*

REPORT NO. BCPD L2-4

\* Brevard County Planning Department  
\*\* NASA, Kennedy Space Center

#### A. PROBLEMS

No unanticipated problems are impeding the progress of the investigation.

#### B. ACCOMPLISHMENTS

Work is continuing on the land use mapping of Orange County. Three additional sectors adjacent (west and north) to the one presented previously\* have been mapped. Tracings of the Landsat classification maps are shown as Figures 1-3.

The present procedure is to correct those maps by checking them against existing aircraft photography located in the Orange County Planning Department. This is done in collaboration with an Orange County planner.

Corrections made in this way are shown in Figures 4-6 where the number outside the parenthesis represents the classification based on the aircraft photography and the number inside the parenthesis represents the classification from the tracing of the Landsat computer map.

In this region, the Landsat map has not delineated urban features (small towns amidst citrus groves) well, so the mapping of the urban features is based entirely on the aircraft photography.

In Figure 4, the unit denoted by A is graded land in an agricultural region. The units marked as B are oak forests. They were found to have histograms inseparable from those of "old" citrus. The unit marked C was shown by the photograph to contain more pasture than citrus. The two sectors indicated by the D were classified as citrus but shown by the photography to be vegetated wetlands. The date of the pass --- March 18, 1974, the dry season --- may have been a contributing factor to that error. The solid portion of the Florida Turnpike also is a correction from the photography;

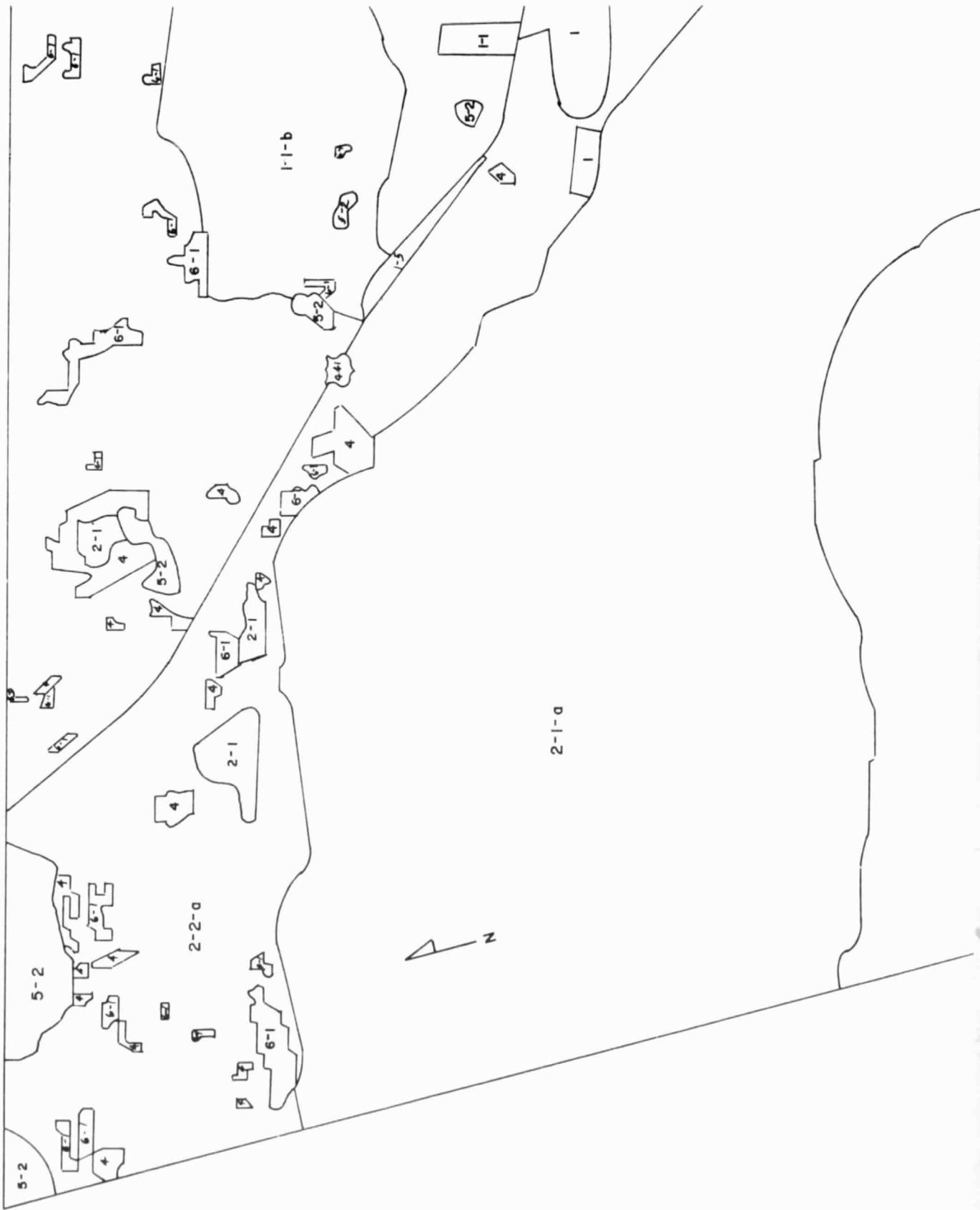
\* Landsat Progress Report for the Period 12 August to 11 November, 1975  
BCPD L2-3, p. 9



**FOLDOUT FRAME**



FIGURE 1  
LANDSAT MAP  
SECTOR 2, ORANGE COUNTY  
SCALE  $\sim \frac{1}{48,000}$

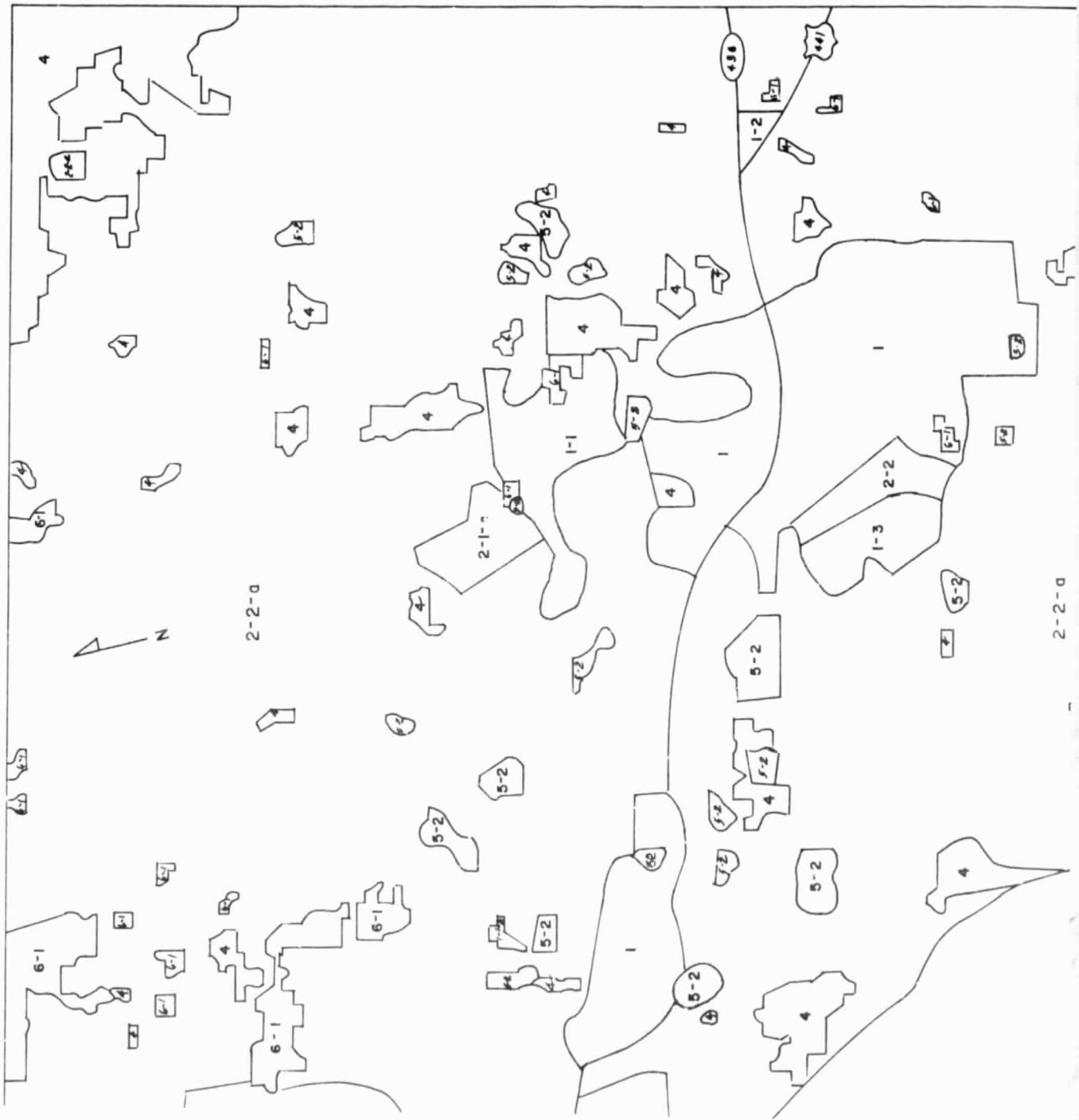


5-2

FIGURE 2  
LANDSAT MAP  
SECTOR 3, ORANGE COUNTY  
SCALE ~  $\frac{1}{48,000}$

-3-

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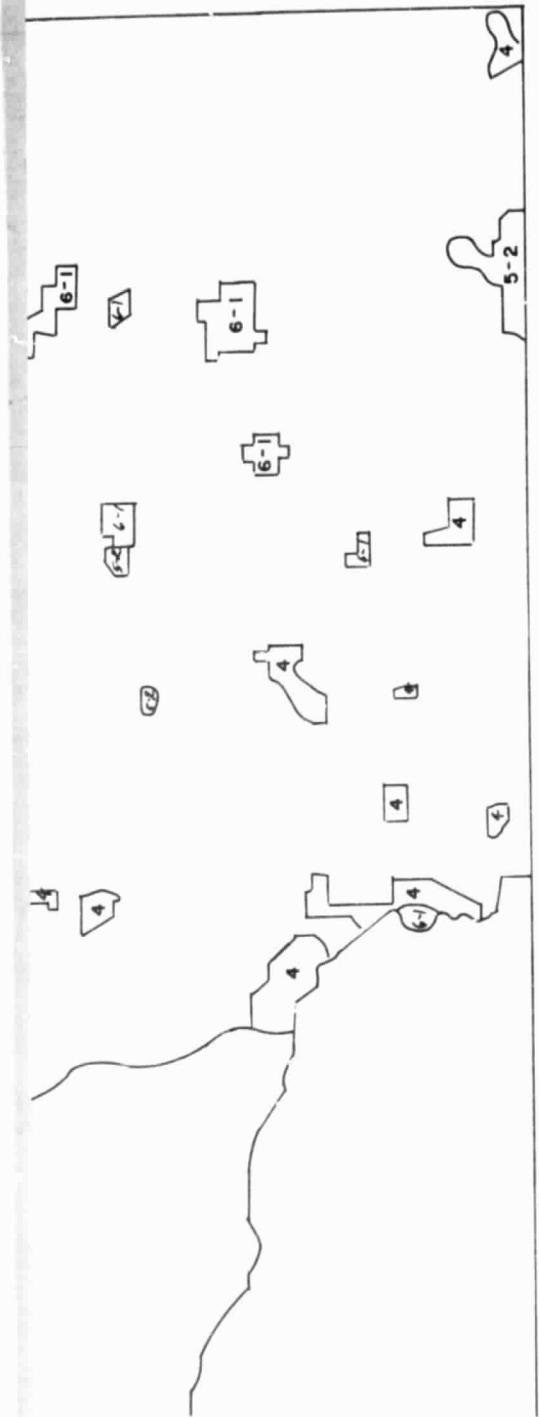
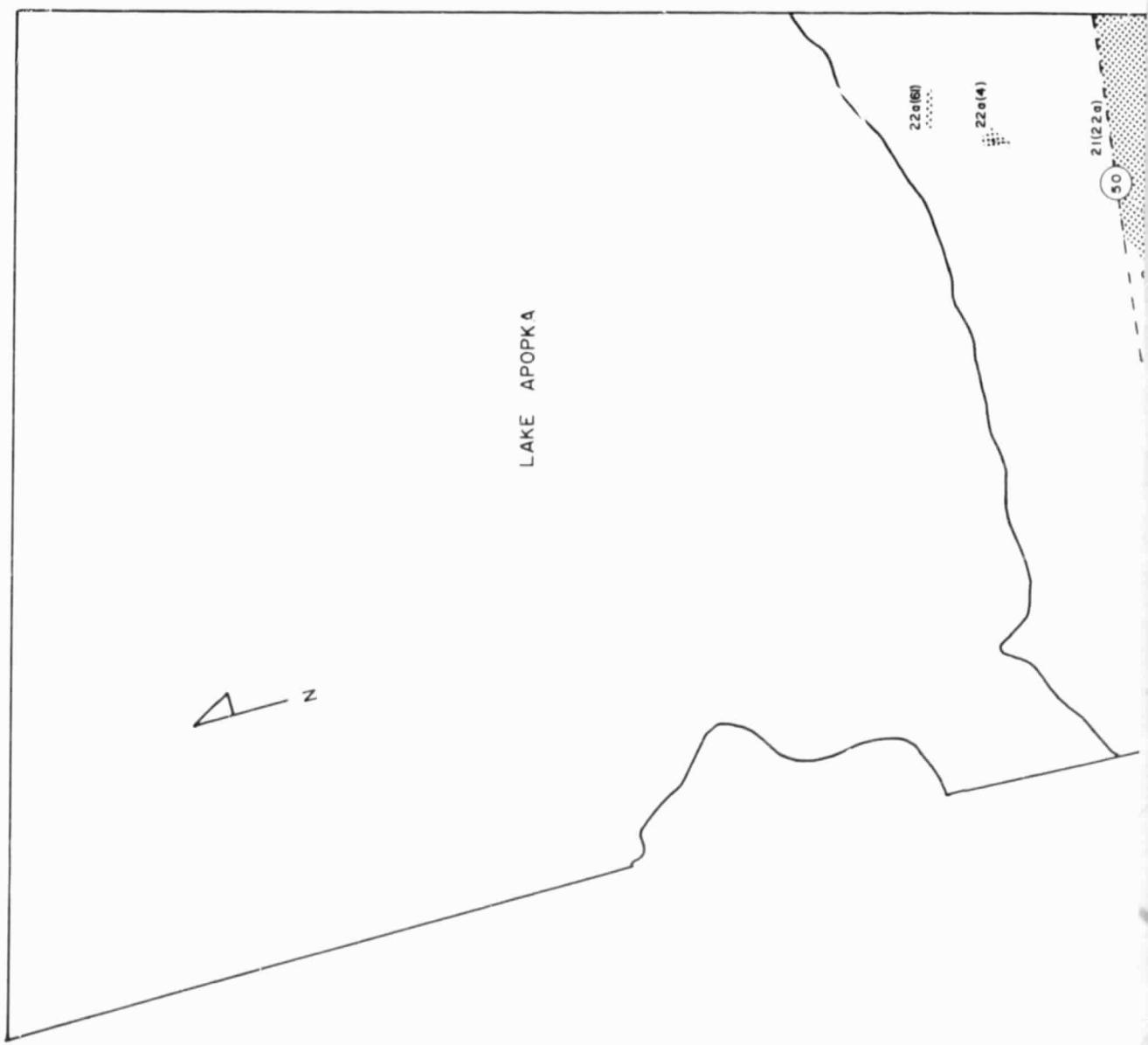


FIGURE 3  
LANDSAT MAP  
SECTOR 4, ORANGE COUNTY  
SCALE ~  $\frac{1}{48,000}$

-4-

FOLDOUT FRAME 2



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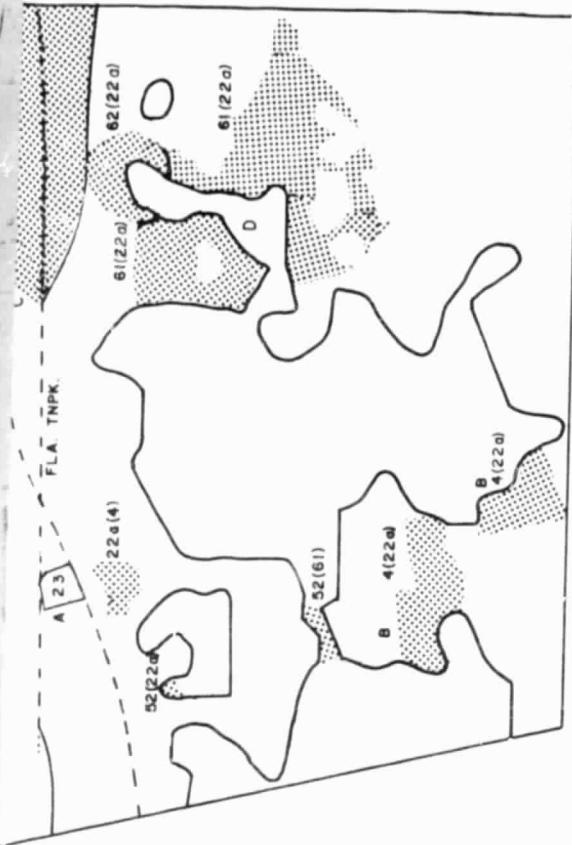
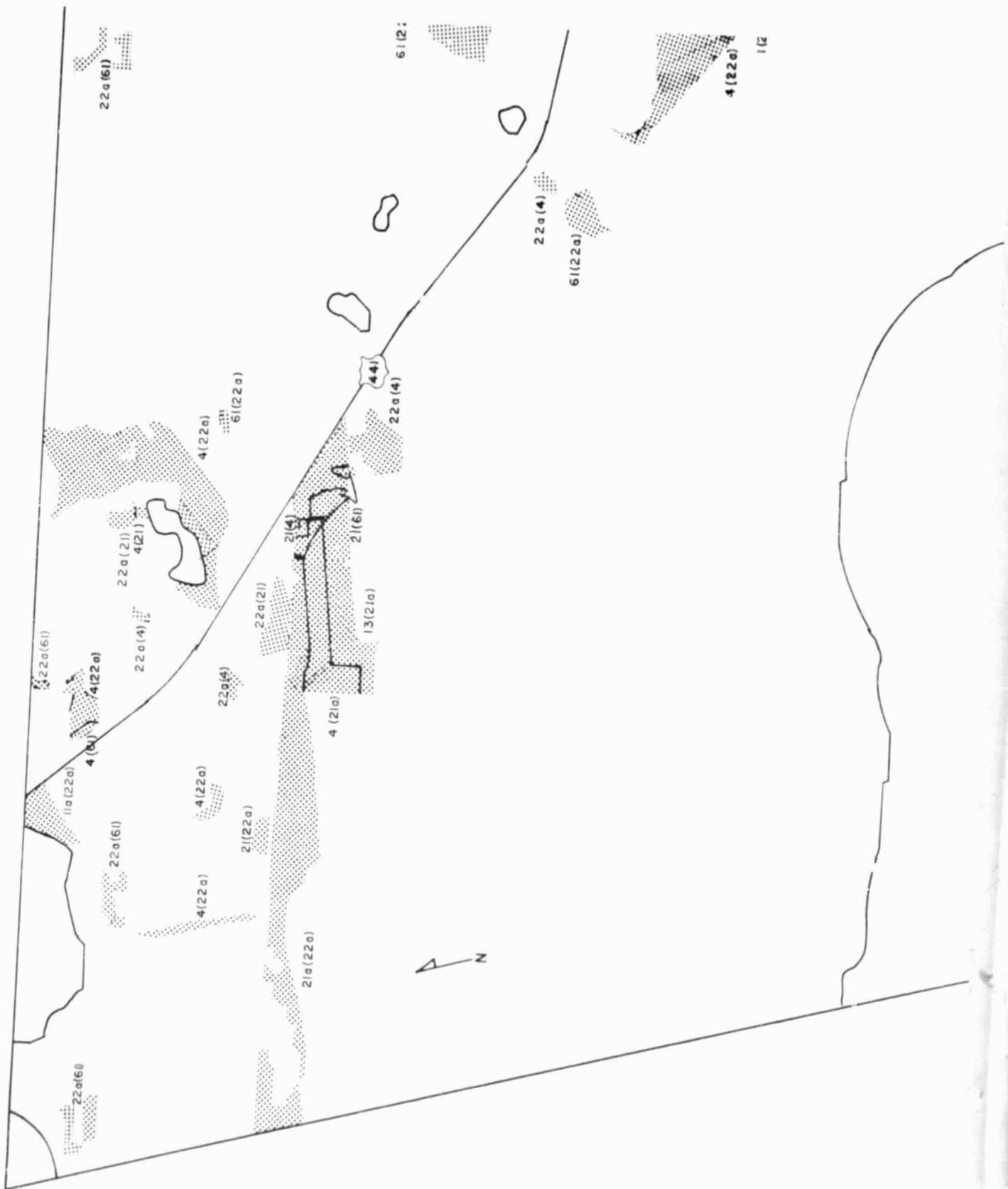


FIGURE 4  
CORRECTIONS TO LANDSAT MAP  
SECTOR 2, ORANGE COUNTY

SCALE  $\sim \frac{1}{48,000}$

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LAKE APOPKA

FIGURE 5  
CORRECTIONS TO LANDSAT MAP  
SECTOR 3, ORANGE COUNTY  
SCALE  $\sim \frac{1}{48,000}$

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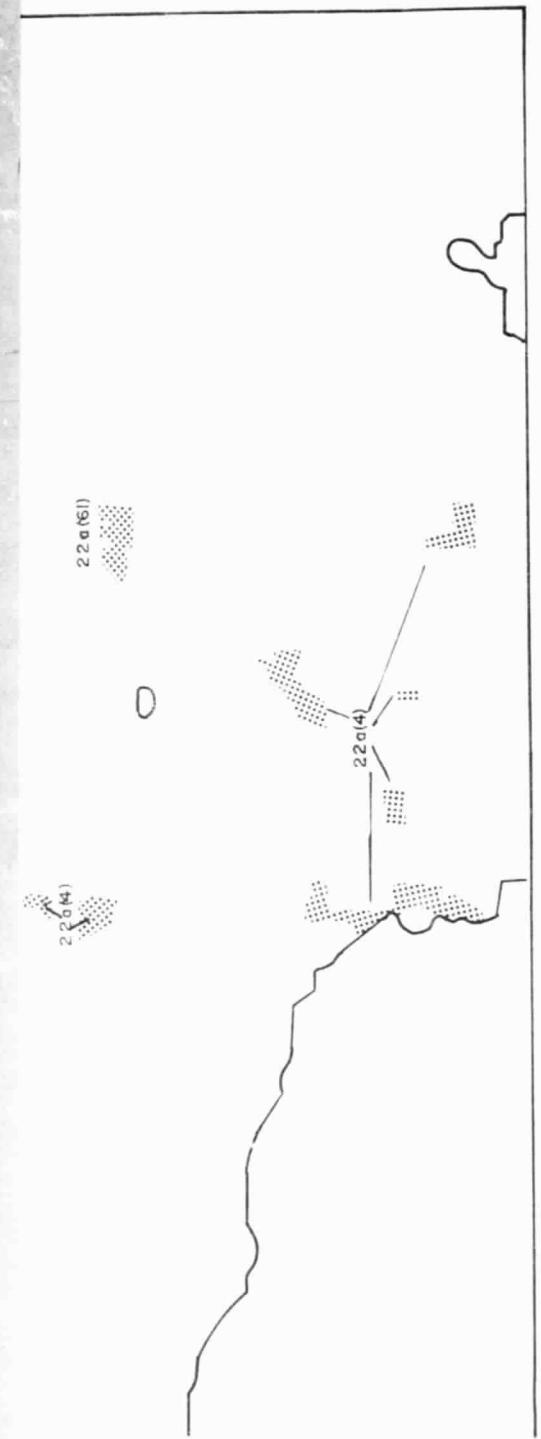


FIGURE 6  
CORRECTIONS TO LANDSAT MAP  
SECTOR 4, ORANGE COUNTY  
SCALE  $\sim \frac{1}{48,000}$

the dashed portions of the highways are as seen on the computer map.

In Figures 5 and 6, no special classes were attempted for the muck farms (vegetable farms) north of Lake Apopka; that classification on the tracing was based entirely on the geometric patterns shown on the computer map.

The major error on Figure 6 is the classification in the northeast corner of a large area which was re-classified as forest on the basis of the photography. This is not dense forest, contains some pasture, scattered houses, some oak, and some pine, mostly scattered. The classification is marginal, but in the photography, trees seemed to dominate.

It is not surprising that the most common error is misclassification as citrus. The a priori probability of citrus, based on an earlier classification, was 0.50. It is our experience that the maximum likelihood classification method makes errors in favor of classes with unusually high a priori probabilities (e.g., 0.5) and against classes with unusually low a priori probabilities; hence, too much citrus in this case. Actually, too much citrus was chosen deliberately as the lesser of two problems in this situation: Our MAX/MIN program seems to make fewer errors of the type discussed above; but when it is used for this region, too much cultivated and young citrus gets classified as urban. In practice, we use the MAXLIK program for mapping the non-urban sectors and the MAX/MIN program for mapping urban features (disregarding "false" urban spots appearing in citrus groves).

The accuracy of the Landsat classification for these two maps is given by Table 1:

CLASS	AREA PRIOR TO CORRECTION HECTARES    ACRES		INCORRECT ( HECTARES )	ACCURACY ( PER CENT )
4 Forest	745	1,838	120	84
21 Agricultural Other Than Citrus	4,825	11,904	99	98
22 Citrus	11,276	27,817	2,226	80
61 Vegetated	349	860	124	64
OVERALL	26,992	66,585	2,603	90

The total area used above does not include urban areas, since they were classified from the photography. The high accuracy for class 21 (agricultural other than citrus) is due to the large muck farm area; if this area is omitted, the classification accuracy for that class becomes 78%. It might justifiably be said that the overall accuracy quoted above is increased by the large area associated with the easily classifiable Lake Apopka. If Lake Apopka is omitted, the overall accuracy becomes 86%. If Lake Apopka and the muck farms are omitted, the overall classification accuracy becomes 82%.

The corrected maps for the three regions are shown as Figures 7-9. (In Figure 7, part of Lake Apopka is cut off.)

Since the immediate use of these maps is preparation of a land use inventory



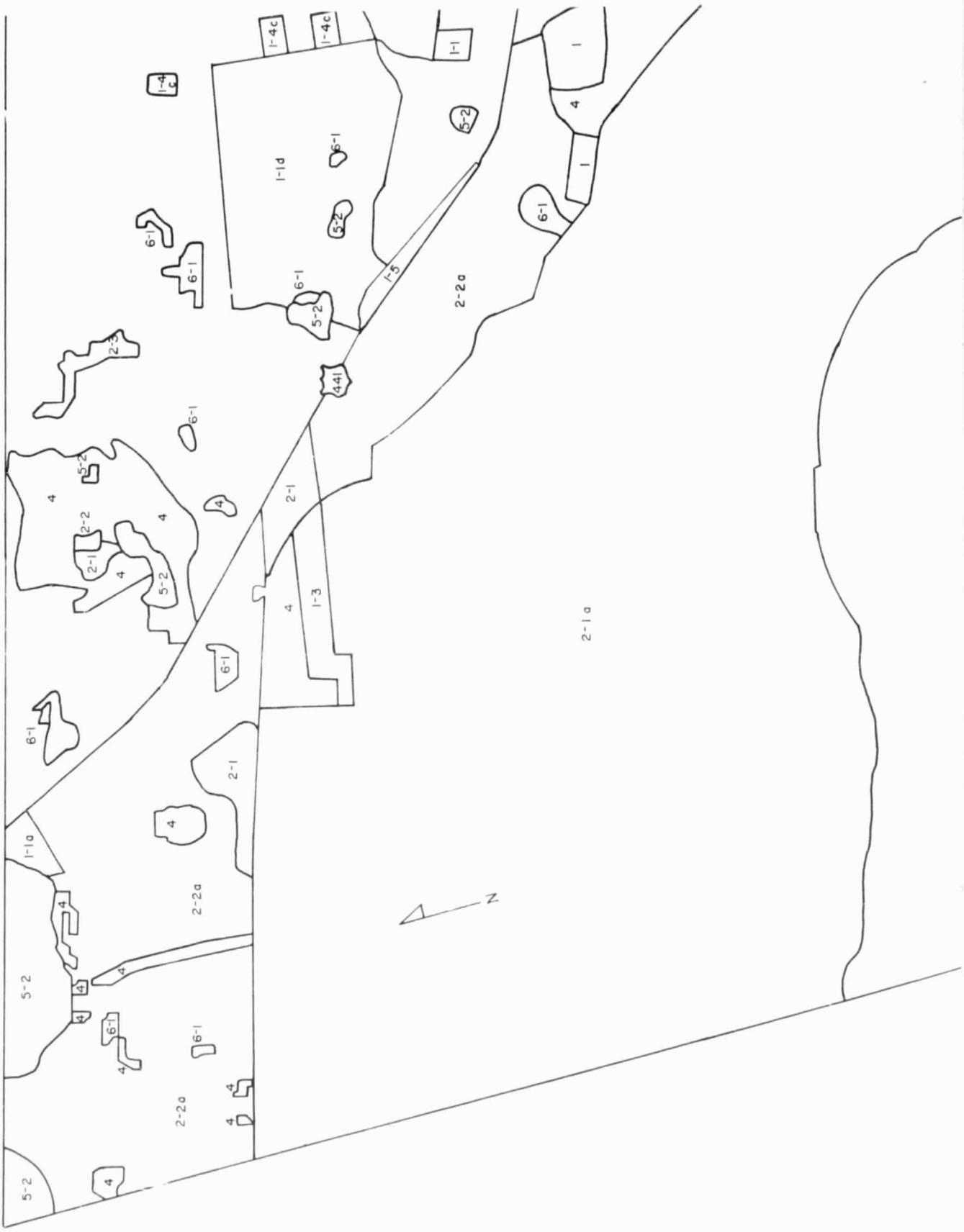
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FIGURE 7

CORRECTED MAP  
SECTOR 2

SCALE  $\approx \frac{1}{48,000}$



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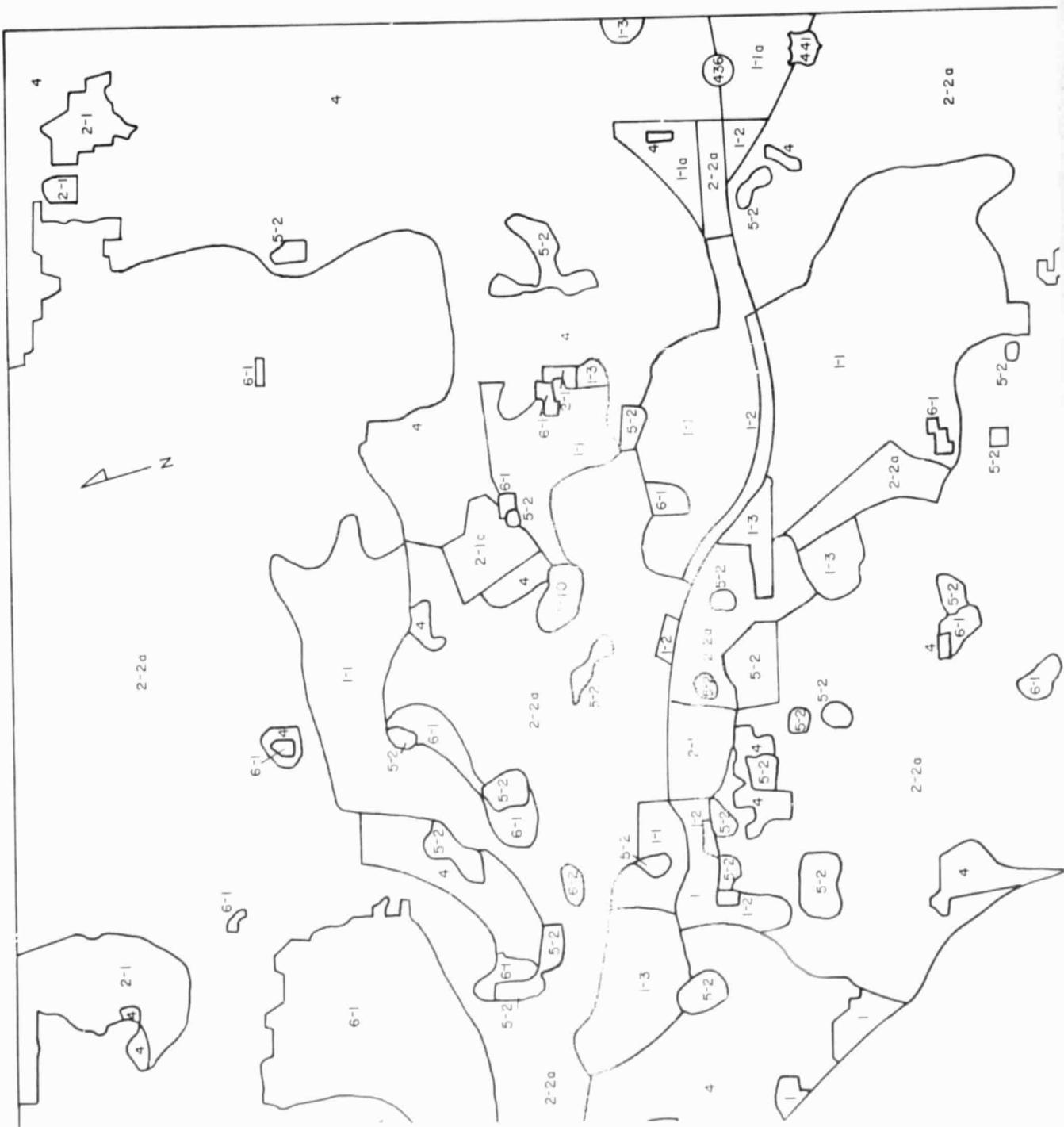
LAKE APOPKA

FIGURE 8

CORRECTED MAP  
SECTOR 3

SCALE  $\sim \frac{1}{48,000}$

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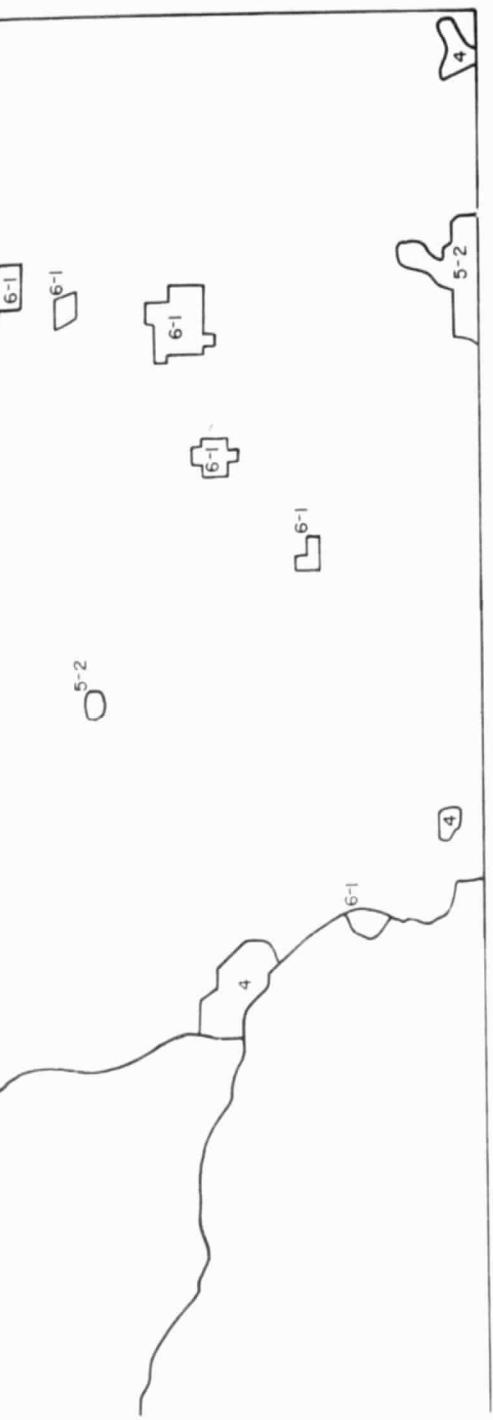


FIGURE 9

CORRECTED MAP  
SECTOR 4

SCALE  $\approx \frac{1}{48,000}$

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with traffic zones as the unit for tabulation, the next step in the process is the drawing of traffic zone boundaries on the map. These lines are transferred from another map, using a Bausch and Lomb Zoom Transfer Scope to provide the stretching which corrects for the problem of unequal scales in the two directions on the computer map. Figure 10 illustrates this for sector 1. Areas are then measured by planimeter in the Orange County Planning Department and tabulated by traffic zone.

Figure 7 also contains traffic zone boundaries, but they are farther apart than in Figure 10. Traffic zones increase in size as the population density decreases; in the city of Orlando, for example, the traffic zones are much smaller than those shown in this report.

C. SIGNIFICANT RESULTS

None

D. PUBLICATIONS

None

E. RECOMMENDATIONS

None

F. FUNDS EXPENDED

Expenditures this quarter: . 265.66

G. DATA USE

<u>VALUE OF DATA ALLOWED</u>	<u>VALUE OF DATA ORDERED</u>	<u>VALUE OF DATA RECEIVED</u>
\$1200	\$632	\$432

Twelve sets of images were received during the quarter. A set of digital tapes ordered previously was received, but for reasons not yet determined, it could not be run on the GE 635. (Parity error indications were given.)



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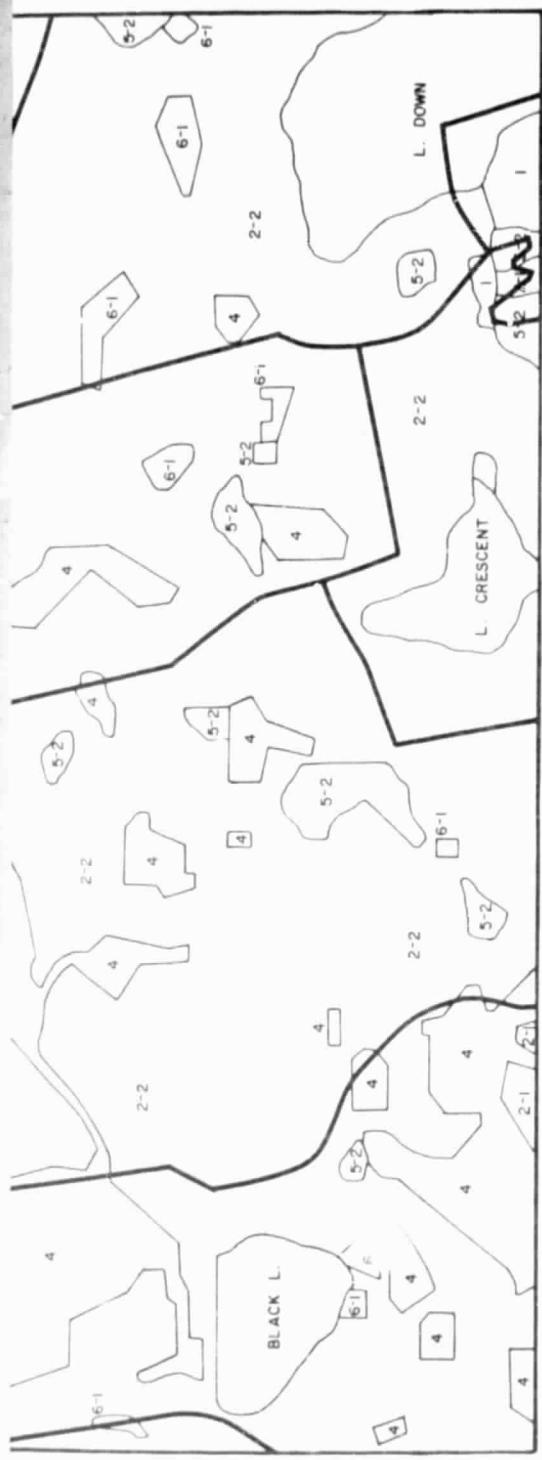


FIGURE 10

FINAL MAP WITH TRAFFIC ZONE BOUNDARIES  
SECTOR 1, WESTERN ORANGE COUNTY

SCALE ~  $\frac{1}{48,000}$

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At the suggestion of EROS, the tapes have been returned to them for checking.

A second set of tapes has been ordered, but by mutual agreement, delivery is being held up until the problem with the first set is resolved.

#### ACKNOWLEDGMENTS

Greg Adkins, of the Orange County Planning Department, is an active collaborator in the Orange County work. He helps with training sample selection, helps check the computer-based maps against photography, makes the final versions of the maps, and makes the planimeter measurements.

## APPENDIX

### LAND-USE CATEGORIES:

#### Level 1

01. Urban and built-up land

02. Agricultural land

03. Rangeland

04. Forest land

05. Water

06. Nonforested wetland

07. Barren land

#### Level 2

01. Residential

- a. Wooded residential
- b. Non-wooded residential
- c. Rural residential
- d. Mobile-home parks
- e. Bare sand (non-landscaped)

02. Commercial and services

03. Industrial

04. Extraction

- a. Phosphate mines
- b. Reclaimed phosphate mines
- c. Clay mining

05. Transportation

07. Strip.

09. Open

10. Institutional & recreational

11. New construction

01. Cropland and pasture

- a. Muck farms (vegetables)
- b. Vegetable farming
- c. Pasture

02. Groves

- a. Primarily citrus

03. Bare sand in agricultural sector

01. Grass

01. Deciduous

02. Evergreen (pine)

03. Mixed

01. Streams and waterways

02. Lakes

03. Other (Gulf of Mexico)

01. Vegetated

02. Bare

03. Sand other than beaches